

What is claimed is:

1           1.       A method for improving the performance of a rotary actuator in a disk  
2 drive, the rotary actuator comprises a voice coil motor (VCM) characterized by a torque  
3 parameter, the disk drive comprises a servo control system having a motor driver circuit  
4 for receiving a series of command effort signals transmitted based on a first seek profile,  
5 and for providing an operating current to the VCM based on the command effort signals  
6 for causing a movement of the actuator from a first radial location to a target radial  
7 location, the method comprising:

8                   recording the series of transmitted command effort signals, and while the  
9 actuator is moving:

10                         adjusting each recorded command effort signal to account for at  
11 least one disk drive influence on the actuator movement;

12                         storing the adjusted command effort signals;

13                         monitoring the velocity of the moving actuator;

14                         calculating an acceleration value corresponding to the moving  
15 actuator from the stored command effort signals and the monitored  
16 velocity; and

17                         adjusting the acceleration value to account for a radial torque  
18 parameter variation.

1           2.       The method as defined in claim 1, wherein the recording further comprises:  
2 comparing each command effort signal to a threshold value; and  
3 determining if the compared command effort signal exceeds the threshold value.

1           3.       The method as defined in claim 2, wherein the storing further comprises:  
2 storing the last command effort signal transmitted prior to the command  
3 effort signal exceeding the threshold value; and

4                         storing a subset of the command effort signals transmitted following the  
5 command effort signal exceeding the threshold value wherein each command  
6 effort in the subset exceeds the threshold value.

1           4.       The method as defined in claim 3, wherein the monitoring further comprises:

2           determining an initial velocity of the moving actuator corresponding to the  
3           first-transmitted command effort signal in the subset of the command effort  
4           signals following the exceeding of the threshold value; and

5           determining a final velocity of the moving actuator corresponding to the  
6           most recently transmitted command effort signal in the subset of the command  
7           effort signals.

1           5.     The method as defined in claim 4, wherein the calculating further comprises:  
2                   calculating a velocity differential between the determined initial velocity  
3                   and the final velocity;

4                   performing a summation of the stored subset of command effort signals  
5                   and generating a summation result;

6                   subtracting a first value corresponding to a selected command effort signal in  
7                   subset of the command effort signals from a second value corresponding to the last  
8                   command effort signal transmitted prior to the command effort signal exceeding the  
9                   threshold value, and generating a subtraction result;

10                  multiplying the subtraction result by a VCM-delay value and generating a  
11                  multiplication result;

12                  adding the multiplication result to the summation result and generating an  
13                  addition result; and

14                  dividing the velocity differential by the addition result and generating a  
15                  first division result wherein the calculated acceleration value comprises the first  
16                  division result.

1           6.     The method as defined in claim 5, wherein the VCM-delay value is a  
2           normalized VCM-delay value of 0.5.

1           7.     The method as defined in claim 5, further comprising:

2                   modifying the first seek profile based on the adjusted acceleration value.

1           8.     The method as defined in claim 7, wherein the movement of the actuator  
2           comprises an acceleration phase followed by a deceleration phase.

1           9.     The method as defined in claim 8, wherein the calculating occurs during  
2           the acceleration phase.

- 1           10.     The method as defined in claim 9, wherein modifying the first seek profile  
2 comprises:  
3                 adjusting the configuration of deceleration phase to reduce a time period  
4                 associated with the movement of the actuator from the first radial location to the  
5                 target radial location.
- 1           11.     The method as defined in claim 10, wherein the threshold value corresponds  
2 to an approximate saturation current of the motor driver circuit.
- 1           12.     The method as defined in claim 11, wherein the subset of command effort  
2 signals comprises a predetermined number of command effort signals.
- 1           13.     The method as defined in claim 12, wherein the predetermined number of  
2 command effort signals is six.
- 1           14.     The method as defined in claim 5, wherein the servo control system comprises  
2 a compensator for determining command effort signals during track-follow operations.
- 1           15.     The method as defined in claim 14, further comprising:  
2                 applying a gain factor to the determined command effort signals based on  
3                 the adjusted acceleration value.
- 1           16.     The method as defined in claim 15, further comprising:  
2                 scaling the gain factor by a ratio of the calculated acceleration value and an  
3                 initial acceleration value wherein the initial acceleration value is determined prior  
4                 to the recording.
- 1           17.     The method as defined in claim 16, wherein the threshold value  
2 corresponds to a current less than a saturation current of the motor driver circuit.
- 1           18.     The method as defined in claim 17, wherein the subset of command effort  
2 signals comprises a predetermined number of command effort signals.
- 1           19.     The method as defined in claim 18, wherein the predetermined number of  
2 command effort signals is three.
- 1           20.     The method as defined in claim 1, wherein the adjusting the acceleration  
2 value further comprises:  
3                 obtaining a value corresponding to the radial torque parameter variation; and  
4                 adjusting the calculated acceleration value based on the obtained value.

1           21.     The method as defined in claim 20, wherein the value corresponding to the  
2 radial torque parameter variation is obtained from a look up table.

1           22.     The method as defined in claim 1, wherein the motor driver circuit  
2 comprises a digital to analog converter (DAC).

1           23.     The method as defined in claim 1, wherein the first seek profile is  
2 determined based on an initial acceleration value determined prior to the recording.

1           24.     The method as defined in claim 1, further comprising:  
2                 reducing the effects of noise-induced deviations in the adjusted  
3 acceleration value.

1           25.     The method as defined in claim 24, wherein the reducing further comprises:  
2                 applying a slew rate limit to the adjusted acceleration profile.

1           26.     The method as defined in claim 25, wherein the reducing further comprises:  
2                 applying a low-pass filter to the adjusted acceleration profile.

1           27.     The method as defined in claim 1, wherein the disk drive influence is  
2 caused by a flex bias of a cable connecting the rotary actuator to the servo system and  
3 wherein the adjusting each command effort signal further comprises filtering a flex bias  
4 feed forward component from the command effort signal.

1           28.     The method as defined in claim 1, wherein the disk drive comprises a disk  
2 having a plurality of recorded servo tracks and wherein the disk drive influence is caused  
3 by a variation in the position of a recorded servo track and wherein the adjusting each  
4 command effort signal further comprises filtering from the command effort signal a  
5 component corresponding to the variation in the position of the recorded servo track.